



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,519	02/17/2004	James M. Cicchiello	NORTE-513A	1352
7663	7590	12/20/2005	EXAMINER	
STETINA BRUNDA GARRED & BRUCKER			FINNEREN, RORY B	
75 ENTERPRISE, SUITE 250			ART UNIT	
ALISO VIEJO, CA 92656			PAPER NUMBER	
			2828	

DATE MAILED: 12/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/780,519	CICCHIELLO ET AL.	
	Examiner	Art Unit	
	Rory Finneren	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on February 17, 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 8-30 is/are rejected.
- 7) ☒ Claim(s) 3-7 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/10/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2 and 8-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko (6,421,166).

Regarding claim 1, Velsko discloses an integrated optical parametric oscillator (Abstract) comprising:

an input face being anti-reflective to an incident pump beam (Fig. 1, #10);

an optical-parametric-oscillation region along an optical path of the pump beam, the OPO region being operative to convert the pump beam into a signal beam and an idler beam, wherein the input face is reflective to the signal beam and the idler beam (Col. 4, lines 15-17; Fig. 1, area between mirrors 20 and 22);

a grating being operative to diffract at least a portion of the signal beam (Fig. 2, #30; Col. 4, lines 12-)

a reflecting plane positioned along an optical path of the signal beam diffracted by the grating, wherein the reflecting plane is reflective to the signal beam (Fig. 1, #20);

an ultra-fine-steering region between the reflecting plane and the grating, the steering region being operative to steer the optical path of the signal beam diffracted from the grating (Fig. 1, #14; Col. 3, lines 56-); and

an output face along an optical path of the signal beam reflected from the grating, the output face being reflective to the pump beam and the idler beam and partially transmissive to the signal beam (Fig. 1, #22).

Velsko discloses the claimed invention except for the positioning of the beam deflector (steering region). It would have been obvious to one of ordinary skill in the art at the time the invention was made to reposition the beam deflector, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko (6,421,166) in view of Levinos (4,189,652).

With regard to claim 2, Velsko discloses line selection (Col. 7, lines 1-) except the reference does not explicitly disclose that the steering region is operative to perform the line selection by steering the optical path of the signal beam. Levinos, however, does disclose a device which is operative to select a narrow line of a signal beam by steering the optical path of the beam ("line-selecting element, G"; Col. 5, lines 4-8). Therefore, it would have been obvious to one skilled in the art at the time of the invention to select a line of the signal beam by steering the optical path of the beam for the purpose of generating a narrow line output beam.

Regarding claim 8, Velsko discloses the integrated OPO wherein the pump beam has a wavelength of about 1.064 micrometers (Col. 2, lines 53-55), the signal beam has a wavelength of about 1.54 micrometers (Col. 7, lines 20-22), and the idler beam has a wavelength of about 3.442 micrometers (Col. 7, lines 22-24).

As to claim 9, Velsko discloses the integrated OPO wherein the pump beam has a wavelength of about 1.064 micrometers (Col. 2, lines 53-55), the idler beam has a wavelength of about 1.54 micrometers (Col. 6, lines 65-66), and the signal beam has a wavelength of about 3.442 micrometers (Col. 5, lines 9-14).

With regard to claim 10, Velsko discloses the integrated OPO wherein the grating includes a holographic grating with 300 grooves/mm (Col. 2, line 50-).

Regarding claim 11, Velsko discloses the integrated OPO comprising a nonlinear optical bulk material (Col. 2, lines 8-) in which a locally periodically-poled region (Col. 2, lines 50-) and a fine-steering region subjected to an electric field are formed (Claim 14, "electro-optic beam deflector").

As to claim 12, Velsko discloses the integrated OPO further comprising a grating between the locally periodically poled region and the steering region (Fig. 2, #30; Col. 4, lines 12-).

Regarding claim 13, Velsko discloses a fine steering region (Fig. 1, #14) operative to steer a selected one of the wavelength components with a predetermined angle (Fig. 1, " $\Delta\theta_p$ ").

With regard to claim 14, Velsko discloses the integrated OPO further comprising a reflecting plane to reflect the steered wavelength component back to the grating (Fig. 1, #20).

Regarding claim 15, Velsko discloses the integrated OPO wherein the nonlinear optical bulk material includes lithium niobate (Col. 2, lines 50-).

As to claim 16, Velsko discloses the integrated OPO wherein the locally periodically-poled region has a length of about 30 mm (Col. 5, lines 66-67).

With regard to claim 17, Velsko discloses the integrated OPO wherein the nonlinear optical bulk material further comprises a plurality of exterior coated planes forming a resonator (Col. 7, lines 16-).

Regarding claim 18, Velsko discloses a tunable, narrow-line laser system comprising: a pump beam source (Fig. 1, #12), an integrated optical parametric oscillator including a nonlinear optical bulk crystal (Col. 4, lines 15-17; Fig. 1, area between mirrors 20 and 22), which further comprises:

- an input face (Fig. 1, #10);

- an optical-parametric-oscillation region converting the pump beam into a signal beam and an idler beam (Fig. 1, #24);

- a grating reflecting a portion of the signal and the idler beam and diffracting the other portion (Fig. 2, #30; Col. 4, lines 12-);

- an output face (Fig. 1, #22);

- a reflecting plane (Fig. 1, #20); and

Art Unit: 2828

a fine-steering region between the grating and the reflecting plane for generating an optical path difference of the other portion of the signal and idler beams (Fig. 1, #14; Col. 3, lines 56-).

As to claim 19, Velsko discloses the claimed invention wherein the pump beam source includes a Nd:YAG laser (Col. 2, lines 53-55).

With regard to claim 20, Velsko discloses the claimed invention wherein the nonlinear optical bulk crystal includes a lithium niobate crystal (Col. 2, lines 50-).

Regarding claim 21, Velsko discloses the claimed invention wherein the OPO region includes a periodically-poled region of the nonlinear optical bulk crystal (Col. 2, lines 50-).

As to claim 22, Velsko discloses the claimed invention wherein the optical-oscillation-region has a length of about 30 mm (Col. 5, line 66).

With regard to claim 23, Velsko discloses the claimed invention wherein the OPO region is operative to convert the pump beam into the signal beam with a wavelength of about 1.54 micrometers (Col. 7, lines 20-22) and the idler beam with a wavelength of about 3.442 micrometers (Col. 7, lines 22-24).

With regard to claim 24, Velsko discloses the claimed invention wherein the OPO region is operative to convert the pump beam into the signal beam with a wavelength of about 3.442 micrometers (Col. 5, lines 9-14) and the idler beam with a wavelength of about 1.54 micrometers (Col. 6, lines 65-66).

Regarding claim 25, Velsko discloses the claimed invention wherein the fine-steering region of the nonlinear optical bulk crystal is subjected to an electric field (Claim 14, "electro-optic beam deflector").

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko (6,421,166) in view of Velsko (5,841,570).

As to claim 26, Velsko discloses the claimed invention except the reference does not explicitly disclose the input face, the grating, the output face, and the reflecting plane all being reflective to the idler beam and arranged as a resonator of the idler beam. Velsko (5,841,570) teaches a tunable narrow-line laser system wherein the input face (Fig. 1, #22), the grating (Col. 9, line 28), output face (Fig.1, #24), and the reflecting plane (Fig. 1, #26) are all reflective to the idler beam and are arranged as a resonator of the idler beam (Fig. 1). Therefore, it would have been obvious to one skilled in the art at the time of the invention to arrange the components of the system as a resonator in order to create an optical parametric oscillator, a device that is well-known in the art.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko in view of Geiger (5,159,487).

Regarding claim 27, Velsko discloses the claimed tunable narrow-line laser system, except for it being operative to generate a narrow-line output with a first power to seed a laser or an OPO with a second power higher than the first power. Geiger does teach a narrow-line laser system operative to generate a narrow-line output with a first power to seed a laser or an OPO with a second power higher than the first power (Col.

Art Unit: 2828

3, lines 9-12). Therefore, it would have been obvious to one skilled in the art at the time of the invention to use a low powered beam to seed a laser or OPO that outputs a higher powered beam for the purpose of increasing the power of the second, higher powered beam.

Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko as applied to claim 27 above, and further in view of Komine (6,215,800).

Regarding claim 28, Velsko discloses the claimed invention except the reference does not explicitly disclose the laser system being operative to generate the narrow-line output at about 1.5 microns. Komine discloses a tunable, narrow-line laser system operative to generate a narrow-line output at about 1.5 microns ("1.45 microns", Col. 5, lines 13-14). Therefore, it would have been obvious to one skilled in the art at the time of the invention to generate a narrow-line output at about 1.5 microns for the purpose of generating output in the near-infrared band.

With regard to claim 29, Velsko discloses the claimed invention except the reference does not explicitly disclose the laser system being operative to generate the narrow-line output between 1 microns and 5 microns. Komine discloses a tunable, narrow-line laser system operative to generate a narrow-line output between 1 microns and 5 microns (Col. 5, lines 17-18). Therefore, it would have been obvious to one skilled in the art at the time of the invention to generate a narrow-line output between 1 microns and 5 microns for the purpose of generating output in the middle-infrared band.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Velsko as applied to claim 27 above, and further in view of Scully (US 2002/0041610).

Regarding claim 30, Velsko discloses the claimed invention except the reference does not explicitly disclose the laser system being operative to generate the narrow-line output between 8 and 12 microns. Scully discloses a tunable, narrow-line laser system operative to generate a narrow-line output between 8 and 12 microns ("laser generation may occur in the mid-infrared range around 9 microns", Paragraph [0035]). Therefore, it would have been obvious to one skilled in the art at time of the invention to generate a narrow-line output between 8 and 12 microns for the purpose of generating output in the mid-infrared range.

Allowable Subject Matter

Claims 3-7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art does not teach an integrated optical parametric oscillator wherein an input face, an optical parametric oscillation region, a grating, an output face, a reflecting plane, and a fine steering region are all on a single slab of nonlinear optical bulk material.

Conclusion

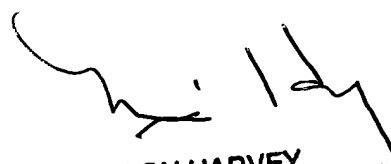
Art Unit: 2828

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rory Finneren whose telephone number is (571) 272-2243. The examiner can normally be reached on Mon. - Fri. 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Oh Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

rbf


MINSUN OH HARVEY
PRIMARY EXAMINER